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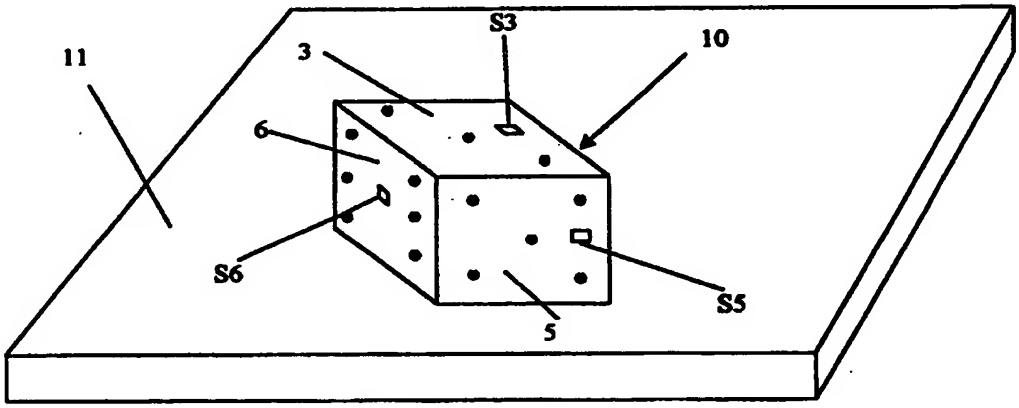

(57) Abstract

An object (10) having n faces, includes wireless transmitting means (12) for transmitting the value of at least the face of the object lying on a surface. In one embodiment, the face of the object (10) has n faces, includes at least n–1 sensors (S) installed therein, a controller (27, 101) coupled to each of the n–1 sensors (S) and a wireless transmitter device (12) coupled to the controller unit (27, 101) for transmitting data from each of the n–1 sensors (S).

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AN ELECTRONIC DICE

FIELD OF THE INVENTION

The present invention relates to computer and board games in general and in particular to such games using one or more dice.

BACKGROUND OF THE INVENTION

It is very well known to use one or more dice in games, such as backgammon and especially in board games such as 'snakes and ladders' and 'monopoly'. In recent years, many of these games have been adapted for use with the computer. In the computer version of these games, the computer acts as the dice thrower and effectively takes control of that particular aspect of the game. In other words the player of the game presses a button, a key, or his mouse in order to initiate the action of the dice throwing. The player, who does not have any physical control over the action of the dice, is prevented from determining the outcome of the dice throw. Consequently, the computer versions of games are less exciting since they lack an important element of the game, the 'feel' and control over the dice throw.

Dice are also an integral part of certain gambling games such as craps, where the throwing of the dice and the resulting fall of the dice are the critically important constituents of the game.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a computerized system for games and other software applications using dice which overcomes the disadvantages of prior systems.

It is a further object of the present invention is to provide an electronic dice which allows the player to control the action of the dice while the result of the throw is communicated to a computer or other electronic device. The electronic device can include a device which converts the transmitted result to an audio output for indicating the result. The audio output is especially useful for blind persons. The device can also be used with games and "video-type" games played on a television.

It is a still further object of the present invention is to provide a device which can be used as a means to prevent software piracy.

It is a still further object of the present invention is to provide a device which can be used as an integral component of one or more software applications.

There is thus provided, in accordance with a preferred embodiment of the present invention, an object having n faces, includes wireless transmitting means for transmitting the value of at least the face of the object lying on a surface.

Additionally, there is provided, in accordance with a preferred embodiment of the present invention, an object having n faces, includes at least n-1 sensors, each of n-1 faces of the object having one of the n-1 sensors installed therein, controller coupled to each of the n-1 sensors and a wireless transmitter device coupled to the controller for transmitting data from each of the n-1 sensors.

Additionally, there is also provided, in accordance with a preferred embodiment of the present invention, an object having n faces, includes at least n-1 transponders, each of n-1 faces of the object having one of the at least n-1 transponders installed therein for transmitting data from each of the n-1 faces.

In addition, there is also provided, in accordance with a preferred embodiment of the present invention, a system for communicating with an object. The system includes at least one transponder installed in the object, for transmitting data from the object, a read/write unit for receiving the transmitted data, and a processing unit coupled to the read/write unit, for processing the data.

The controller includes one of a group of devices including a register, processor, buffer, control logic and micro-controller. The wireless transmitter device includes one of a group of devices including an infra-red, transmitter and a RF transmitter, ultra sonic.

Furthermore, in accordance with a preferred embodiment of the present invention, the read/write unit includes a base station transceiver having an antenna attached thereto, a microcontroller coupled to the base station transceiver.

Furthermore, in accordance with a preferred embodiment of the present invention, the processing unit is coupled to the read/write unit by any of the following group including serial RS232, parallel, USB (Universal serial Bus) and SCSI (small computer system interface) or keyboard interface.

In addition, in accordance with a preferred embodiment of the present invention, the system according further includes a surface for throwing the object thereon. The surface includes sealing means used with a dice having optical sensors to prevent light from reaching the face of the object in contact with the surface. The surface may be composed of a metallic material used with a dice having a transponder

Furthermore, in accordance with a preferred embodiment of the present invention, the system according also can include a CCD (charge coupled camera) for imaging at least one face of the object.

Furthermore, in accordance with a preferred embodiment of the present invention, the transponder includes a radio frequency (RF) transceiver, electrically erasable programmable read-only memory (EEPROM) storage means coupled to the radio frequency transceiver, and an a controller. The controller is connected

to the memory means and the RF transceiver. The EEPROM storage means includes an ID code and/or encrypted data stored therein.

Alternatively the transponder includes radio frequency (RF) transceiver and electrically erasable programmable read-only memory (EEPROM) storage means coupled to a micro-controller.

In addition, in accordance with a preferred embodiment of the present invention, the object includes an input register coupled to the RF transceiver for latching the signals being transmitted by each of the at least n-1 sensors at predetermined intervals.

The electrical components of the objects receive their operating energy from either a remote read/write unit, solar cells, dry-cell batteries, or photo-voltaic cells coupled thereto. The sensors include photodiode, photo-transistor sensors, capacitance sensor or induction coil and mechanical sensors.

In addition, in accordance with a preferred embodiment of the present invention, there is also provided a software piracy protection system which includes at least one object, having an ID code encrypted therein and including a transponder, and a read/write unit for verifying the authenticity of the encrypted ID code for each of the at least one object.

Furthermore, in accordance with a preferred embodiment of the present invention, the object includes additional ID codes encrypted in the transponder, each of the ID codes being related to a separate software application. Alternatively, the object includes a single ID code which is related to a specific software application.

In addition, in accordance with a preferred embodiment of the present invention, there is also provided apparatus for use with a software driven application. The apparatus includes at least one object, having an ID code encrypted therein and including a wireless transceiver, and a software application for verifying the authenticity of the encrypted ID code of the object in order to run a software application. Furthermore, the object may be an integral component of the software application.

In addition, a method for indicating the value of the uppermost face of an n-sided object laying on a surface is provided. The method includes the steps of:

the object transmitting data from at least the uppermost or lowermost face of the object; and

processing the data.

The object includes an ID code encrypted therein and a wireless transceiver and further includes the step of the transceiver transmitting a coded identification signal to the object to decrypt the encrypted ID code.

Additionally, there is provided a method for protecting at least one software application stored in a computer. The method includes:

storing data associated with the at least one software application in the object;

the computer transmitting encrypted ID codes to the object; and

if the object contains the ID code, the object;

transmits the data to the computer; and

verifies the authenticity of the transmitted data in order to run the at least one software application.

Finally, there is provided a method for protecting a plurality of software applications running in a multi-tasking environment, the method includes:

storing data associated with each of the plurality of software applications in each of a plurality of objects;

transmitting the data from each of the plurality of objects to the multi-tasking environment; and

verifying the authenticity of the transmitted data in order to run each of the plurality of software applications.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the appended drawings in which:

Fig. 1 is a schematic illustration of an electronic dice, according to a preferred embodiment of the present invention;

Fig. 2 is a block diagram illustration of a computerized system utilizing the electronic dice of Fig 1;

Figs. 3A and 3B are schematic block diagram illustrations of the RFID tag used within the dice of fig. 1;

Fig. 4 is a schematic block diagram illustration of the transceiver coupled to a computer of the system of Fig.2; and

Figs. 5A -5D are flow chart illustration of the operation of the system of Fig. 2.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Reference is now made to Figs. 1 and 2. Fig. 1 is a schematic illustration of an electronic dice 10, according to a preferred embodiment of the present invention. Electronic dice 10 is configured, in the example of Fig. 1, to look like a standard dice having six faces, numbered form 1 to 6. In Fig. 1, three faces, numbered 3, 5 and 6, are visible and one face (opposite "3"), is lying face down on a surface 11. Each face of the dice 10 comprises a sensor, generally designated S and individually referenced S1, S2, S3, S4, S5 and S6, corresponding to each of the numbers one to six respectively. As best seen in Fig. 2, dice 10 further comprises a wireless transmitter device such as an RFID (Radio Frequency Identification) transponder (or tag) 12 which is in wireless communication with a read/write unit 14 coupled to a computer 16

The RFID tag 12 receives signals from each of the sensors S via a controller (not shown) which it can then transmit to read/write unit 14. The computer 16 processes the signals received by read/write unit 14 in order to identify the face next to the surface 11 and thus, its uppermost face ("3" in the example of Fig. 1).

The connection between the read/write unit 14 and the electronic dice 10 is by means of a wireless communication such as, radio frequency (RF), infrared or any other suitable cordless communication.

In one preferred embodiment, electronic dice 10 comprises a plurality of sensors S which are coupled to a RFID tag 12. It is a feature of electronic dice 10 that RFID tag 12 is capable of receiving data from each of the sensors S1...S6 built into each face of the dice 10 and furthermore can communicate the position of the dice 10 to the computer 16 .

It will be appreciated that the present invention is not limited to a six-sided dice, but is applicable to any object having at least two faces.

The purpose of the sensors S is to determine the face upon which the dice falls. Since one face of the dice 10 is always obscured (five faces always being visible), by analyzing the signals received from each of the sensors S1...S6,

it is possible to determine which face is face down (obscured) and thus which face is uppermost.

Any suitable type of sensor may be used, the type of sensor being selected depending upon the particular implementation. Sensors S include, but are not limited to, induction coil sensors, capacitance sensor, mechanical and optical sensors.

In a preferred embodiment of the invention a plurality of optical sensors (S1, S2,..S6), one in each face is used. Optical sensors S include but are not limited to photodiode and photo-transistor sensors such as the model OD44L photodiode manufactured by the OKI Company of Japan. When a dice has been thrown onto a playing surface (board), for example, one of its faces will be face down and will be transmitting a "0" signal. In other words, the 'obscured' face will be generating a 'dark' current, equivalent to logic value of "0". In contrast, all the other faces will generate a 'light' current, having a logic value of "1". The face lying closest to the board is thus known and by analysis it is possible to determine the uppermost face of the dice. The type of board (playing surface) to be used with optical sensors is one which totally seals off the light from the bottom face so as prevent the optical sensor in the bottom face from emitting a signal.

The controller may be any suitable device known in the art such as a register, processor, buffer and micro-controller.

In an alternative embodiment, a RFID transponder, preferably anti-collision to prevent interference between signals, is located in each of the faces of the dice may be used together with a metal playing surface. The face of the dice falling onto the metal surface will not able to transmit a signal. All the other five faces of the dice will be transmitting a signal and, on the basis of elimination, it will be possible to identify the uppermost face.

Any suitable type of commercially available, anti-collision, RFID transponder may be used such as the Hitag™ HT1 transponder manufactured by Mikron Gmbh. of Gratkorn, Austria.

It will be appreciated by persons skilled in the art that it is not essential that an optical sensor or, in the alternative embodiment, a RFID tag be located in

each face of the dice in order to determine the value of the non-transmitting face. For a dice having n faces, a minimum of n-1 sensors need to be installed. This can be demonstrated by the example of a dice having 6 (n) faces and 5 (n-1) sensors. Should, the dice land on the face not having a sensor, five sensors will be transmitting data and by elimination, the non-transmitting face is thus next to the playing surface. Should, the dice land on one of the faces having a sensor, only four sensors will transmit data. In this case, the non-transmitting sensor identifies the face next to the playing surface.

In the preferred embodiment of the invention, dice 10 is a 'passive' dice using RF transmissions to receive its energy source. In contrast to an "active" dice which contains its own source of power, such as a battery, the 'passive' dice receives its operating energy from a remote energy source. A description of the transmission of energy to RFID tag 12 will be described hereinbelow.

Reference is now made to Figs. 3A and 3B which are block diagram illustrations of alternative embodiments of RFID tag 12.

Referring to Fig. 3A, RFID tag 12 comprises a RFID transponder 80 comprising commercially available components including an RF transceiver 20 having memory storage means 22, such as EEPROM connected thereto. RFID tag 12 further comprises an ID block 26 connected to a controller 27. Controller 27 is also connected to memory means 22 and RF transceiver 20.

RFID transponder 80 is any suitable commercially available tag, such as the TEMIC semiconductor e5550, manufactured by Temic Telefunken Microelectronic Gmbh of Heilbronn, Germany.

Memory storage means 22 is preferably an EEPROM (electrically erasable programmable read-only memory) chip configured to store an unique identification (ID code) for each RFID tag enabling more than one dice to be used in a system. In addition, other encrypted data can also be stored in the EEPROM 22.

RFID tag 12 further comprises an input register 24 which is coupled to RF transceiver 20 and controlled by controller 27.

The sensors S are coupled to input register 24 which latches the signals being transmitted by the sensors S at regular pre-determined intervals, for example, every 0.05 msecs. Each of the sensors (S1...S6), as well as the RF tag, receive their operating energy (VCC) from RF transceiver 20.

ID block compares and checks the signal code received by the RF transceiver 20 from read/write unit 14. The contents of the dice 10 (input register 24 and EEPROM 22) are only transmitted if the codes match the ID data stored in EEPROM 22.

It is a further feature of the present invention to use an ID code which protects the electronic dice from being illegally copied. Each RFID tag within the dice is configured with its own ID code which is compared with a code transmitted by the computer. Thus, it is possible to check the legality or originality of the particular electronic dice and whether the game, or software application using the dice, is a copy or an original. In other words, the ID code acts to prevent fraudulent copying of dice 10, and the game or application using the dice.

Since a standard transponder (tag) does not have its own energy source, in order for RFID tag 12 to transmit or receive data to read/write unit14, it requires energy from an external source. In the preferred embodiment of the invention, the dice 10 receives its operating energy via electromagnetic waves transmitted by read/write unit 14 via a transceiver 32 (see Fig. 4 hereinbelow).

Thus, dice 10 does not require its own energy source. Instead, it receives its energy directly from the read/write unit14. Using the energy supplied by the read/write unit 14 to the sensors S, the RFID tag 12 transmits the status of the dice 10 to the computer 16. An advantage of a passive dice is that it is not necessary to replace the battery (or other energy source) within the dice.

In an alternative embodiment, energy may be supplied to the dice 10 by means of solar cells, dry-cell batteries, photo-voltaic cells or similar.

In the alternative embodiment illustrated in Fig. 3B, the transponder interface 180 (which performs functions similar to tag transponder 80 of Fig. 3A) comprises an RF transceiver 20 having memory storage means 22, such as EEPROM connected thereto. RFID tag 12 is similar to Fig. 3A except that the

RFID tag comprises a micro-controller 101 (instead of input register 24 controller 27, and ID block 26 of Fig. 3A) which is coupled to RF transceiver 20.

The sensors S are coupled to micro-controller 101 which latches the signals being transmitted by the sensors S at regular pre-determined intervals, as described hereinabove with respect to Fig. 3A. The functions of ID block 26 and controller 27 are carried out by micro-controller 101. Reference is now made to Fig. 4 which is a block diagram illustration of the read/write unit 14 coupled to computer 16.

Read/write unit 14 comprises a microcontroller 30 or control logic coupled to a base station transceiver 32 having an antenna 33 attached thereto. The station transceiver 32 is any suitable commercially available transceiver, such as model U2270B manufactured by Temic Telefunken Microelectronic Gmbh of Heilbronn, Germany.

Read/write unit 14 is preferably also coupled to the computer by any suitable means, such as serial RS232 or parallel, USB (Universal serial Bus), SCSI (small computer system interface) or keyboard interface, for example.

It will be appreciated by persons knowledgeable in the art, that the type of read/write unit 14 utilized will be determined by the type of dice and the method of transmission. For instance, as in the of preferred embodiment, the dice and the read/write unit 14 will be based on a similar RFID technology. Similarly, if the dice uses infra-red technology for transmission then the read/write unit 14 will of course be configured to receive infra-red technology.

A system utilizing the electronic dice 10 is described with reference to the flow charts of Figs. 5A - 5D, which describe the operational steps of a sample calling application 200.

Referring to Fig. 5A, the calling application 200 sends an "ID code" and command type to the dice operating program (step 202). Depending on the specific command type, the computer performs the appropriate routine (step 210). Two possible examples are illustrated; Fig. 5B which is a flow chart illustration for checking the authenticity of the dice and/or the software application (step 212)

and Figs. 5C-5D which is a flow chart illustration for checking the status of the dice (step 214).

Reference is now made to Fig. 5B, which is a flow chart illustration of the process of verifying the authenticity of the application (212). For the purposes of example only, and without in any way limiting the invention, a dice having an ID code is used with the application. The read/write unit 14 transmits the ID code and command type to the dice 10 (step 220). If the dice does not respond (query box 222), the program transmits an error code (224) and returns to the calling application (200).

If the dice 10 is genuine, the dice responds to the signal and transmits the contents of the EEPROM 22 to the read/write unit 14 (step 226). The transmitted data is sent to the application (step 228) and control returned to the calling application (200).

Reference is now made to Figs. 5C-5D which is a flow chart illustration of the processing of data received from dice 10 (214). The dice 10 can exhibit one of four stages, as follows:

M1. The dice remains immobile for a pre-determined time (ex. at least 1 sec);

M2. The dice is not lying on the playing surface (ex. being held by one of the players);

M3. The dice has been thrown on to the playing surface and is in motion, that is rolling on the surface for a pre-determined time (t1, for example, between 0.5-1 secs); and

M4. The dice has landed on the surface at least once and is now immobile on the surface for at least t2 secs..

While the dice is in state M1 (300), that is immobile, loop 302 is performed, that is the sensors S on the dice are read by read/write unit 14 (step 304), and the status of the dice is checked (query box 306) until there is a change to state M2 (308), that is, the dice has been lifted up, for example.

If the dice has been lifted off the surface and state M2 (308) is operative, loop 310 is performed. The dice is read again (step 312) and the state of the dice

checked (step 314) to ascertain whether a change to state M3 (316) has occurred.

The dice program continually reads the state of dice 10 until there is a change to state M3 (316). If state M3 has occurred (316), that is, the dice has been thrown and is rolling on the playing surface, the status of the dice is checked as to whether state M3 still applies (step 318).

If the dice has been rolling for more than a pre-determined time of say t1 secs (query box 320), state M4 applies (324). Loop 326 is performed, that is the status of the dice is read again (step 328) to ascertain whether the dice is stable (query box 330). If the status of the dice has not changed, that is, it has remained stable for more than t2 secs, the result of the dice throw is transmitted to the calling application (332). Control is then returned back to the calling application (200).

If, at stage 320, t1 secs has passed without the dice exhibiting rolling, an 'illegal' result is flagged and loop 322 is performed. That is, the application returns to state M1 (302) and steps 304 - 320 are repeated.

It will be appreciated by persons skilled in the art that the operational steps described hereinabove with respect to Figs. 5A-5D , may be performed by the host computer 16 and / or other suitable microcontroller.

In the preferred embodiment of the invention the optical sensors place within each of the faces of the dice are coupled to the RFID tag in order to transmit the status of the dice to the reader.

It will be appreciated by persons skilled in the art that the present invention is not limited to the dice and type of sensors described in the above embodiments but may also include other types of sensors. For instance, in an alternative embodiment, an induction sensor comprising a coil may be implanted into each face of the dice. In this case, the dice is thrown onto a metal board connected to an electric supply. The face of the dice falling onto the board induces a current thereby indicating the value of that face.

In a further alternative embodiment, a CCD (charge coupled device) camera is imbedded into the playing surface onto which the dice is thrown. A

standard dice is used and the camera, which is coupled to a computer, photographs the face of the dice landing face down on the surface. The uppermost face of the dice can thus be determined. In a yet further alternative embodiment, a CCD or other digital type camera is positioned above the playing surface onto which the dice is thrown to photograph the topmost face of the dice. The camera is coupled to a computer for processing the resulting pictures.

It will also be appreciated by persons skilled in the art that the electronic dice of the invention is not limited to applications relating to games, but may also be used as a means to prevent software piracy. For instance, as described hereinabove with respect to Fig. 3A, a RFID tag 12, which has been adapted to contain a unique ID code or other encrypted data within its EEPROM memory 22, is installed within the dice,. A read/write unit, similar to read/write unit 14, coupled to a computer or other processing unit can verify the authenticity of the ID code/encrypted data stored within dice object, in a manner similar to the flow chart of 5B , described hereinabove. Thus, a manufacturer of a software application can supply an encrypted dice object with the application. The application can be programmed to require verification of the dice object in order to run the application.

Other known methods of software protection which use a hardware 'dongle' connected to a computer together with software to protect the application, have a disadvantage in that only a few (usually limited to two or three) "dongles" may be coupled to a computer at any one time. Thus, for a user having numerous different applications installed in his computer, each of which uses a "dongle" , it is generally not a satisfactory solution to use them.

In contrast, since the electronic dice or object uses a wireless transmission system and is not connected to the computer, a large number of protected applications which may be run simultaneously in a multi-tasking environment, for example. ,

It will be further appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein above. Rather the scope of the invention is defined by the claims which follow:

CLAIMS

1. An object having n faces, comprising wireless transmitting means for transmitting the value of at least the face of the object lying on a surface.

2. An object having n faces, comprising:

   a. at least n-1 sensors, each of n-1 faces of said object having one of said at least n-1 sensors installed therein;

   b. a controller coupled to each of said at least n-1 sensors; and

   c. wireless transmitter device coupled to said controller, said wireless transmitter device transmitting data from at least one of said at least n-1 sensors.

3. An object according to claim 2 wherein said controller is a device selected from a group consisting of a register, processor, buffer control logic and micro-controller.

4. An object according to claim 2 wherein said wireless transmitter device is a device selected from a group consisting of an infra-red transmitter RF transceiver and an ultrasonic transmitter.

5. An object according to claim 2 wherein said wireless transmitter device is a transponder, said transponder comprising:

   a radio frequency (RF) transceiver;

   electrically erasable programmable read-only memory (EEPROM) storage means coupled to said radio frequency transceiver; and

   controller connected to said memory means and said RF transceiver.

6. An object according to any of claims 2 - 5 and wherein said controller is coupled to said RF transceiver for latching the signals being transmitted by each of said at least n-1 sensors at predetermined intervals.

7. An object according to any of claims 4 - 6 wherein the electrical components of said object receive their operating energy from a remote transceiving unit.

8. An object according to any of claims 4 -6 wherein the electrical components of said object receive their operating energy from any of a group of power supplies including solar cells, dry-cell batteries, photo-voltaic cells coupled thereto.

9. An object according to any of claims 5 -8 wherein said EEPROM storage means comprises an ID code and/or encrypted data stored therein.

10. An object according to any of claims 2 -9 wherein said sensors comprise photodiode, photo-transistor sensors, mechanical sensors, capacitance sensors or induction coil sensors.

11. An object having n faces, comprising at least n-1 transponders, each of n-1 faces of said object having one of said at least n-1 transponders installed therein for transmitting data from each of said n-1 faces.

12. An object according to claim 11 wherein said at least n-1 transponders comprise:

a radio frequency (RF) transceiver;

electrically erasable programmable read-only memory (EEPROM) storage means coupled to said radio frequency transceiver; and

a controller, connected to said memory means and said RF transceiver.

13. An object according to any of claims 11 - 12 wherein said at least n-1 transponders receive their operating energy from a remote transceiving unit.

14. An object according to any claims 12 - 13 wherein at least one of said EEPROM storage means comprises an ID Code and/or encrypted data stored therein.

15. A system for communicating with at least one object, said system comprising:

a wireless transmitter device installed in said object, for transmitting data from said at least one object;

a read/write unit for receiving said transmitted data; and

a processing unit coupled to said read/write unit, for processing said data,

16. A system according to claim 15 and wherein said read/write unit comprises:

a. a base station transceiver having an antenna;

b. a microcontroller or control logic coupled to said base station transceiver.

17. A system according to claim 15 - 16 wherein said processing unit is coupled to said read/write unit by means of a coupling comprising any of the following group including serial RS232, parallel, USB (Universal serial Bus) and SCSI (small computer system interface) or keyboard interface.

18. A system according to any of claims 15 - 17 wherein said object comprises:

a. n faces;

b. at least n-1 sensors, each of n-1 faces of said object having one of said at least n-1 sensors installed therein;

c. a controller unit coupled to each of said at least n-1 sensors; and

d. wireless transmitter device coupled to controller, said wireless transmitter device transmitting data from at least one of said at least n-1 sensors.

19. An object according to claim 18 wherein said controller is a device selected from a group consisting of a register, processor, buffer control logic and micro-controller.

20. An object according to claim 18 wherein said wireless transmitter device is a device selected from a group consisting of an infra-red transmitter, RF transmitter and an ultrasonic transmitter.

21. An object according to claim 18 wherein said wireless transmitter device comprises:

a radio frequency (RF) transceiver;

electrically erasable programmable read-only memory (EEPROM) storage means coupled to said radio frequency transceiver; and

a controller connected to said memory means and said RF transceiver.

22. A system according to claim 21 and further comprising controller coupled to said RF transceiver for registering the signals being transmitted by each of said at least n-1 sensors at predetermined intervals.

23. A system according to any of claims 21 - 22 wherein said electrical components of said object receive their operating energy from a remote read/write unit.

24. A system according to any of claims 21 -23 wherein said electrical component of said object receive their operating energy from any of a group of power supplies including solar cells, dry-cell batteries, photo-voltaic cells coupled thereto.

25. A system according to any of claims 21 -24 wherein said EEPROM storage means comprises a ID code and/or encrypted data stored therein.

26. A system according to any of claims 20 -25 wherein said sensors comprise photodiode, photo-transistor sensors, mechanical sensor capacitance sensor or induction coil sensors.

27. A system according to claim 15 -17 wherein said object comprises:

n faces; and

at least n-1 transponders, each of n-1 faces of said system having one of said at least n-1 transponders installed therein for transmitting data from each of said n-1 faces.

28. A system according to claim 27 wherein said at least n-1 transponders comprise:

a radio frequency (RF) transceiver;

electrically erasable programmable read-only memory (EEPROM) storage means coupled to said radio frequency transceiver; and

a controller, connected to said memory means and said RF transceiver.

29. A system according to any of claims 27 - 28 wherein said at least n-1 transponders receive their operating energy from a remote transceiving unit.

30. A system according to any claims 27 -29 wherein at least one of said EEPROM storage means comprises a ID code and/or encrypted data stored therein.

31. A system according to any of claims 15 -30 and further comprising a playing surface for throwing said object thereon.

32. A system according to claim 31 wherein said playing surface comprises sealing means to prevent light from reaching the face of said object in contact with said surface.

33. A system according to any of claims 31- 32 wherein said playing surface is composed of a metallic material.

34. A system according to any of claims 15 -33 and further comprising a CCD (charge coupled camera) for imaging at least one face of said object.

35. A system according to claim 34 and wherein said processing unit processes data from said CCD for onward transmission by said transceiver.

36. A software piracy protection system comprising:

    a. at least one object, comprising a transponder each of said at least one object having an ID code encrypted in said transponder; and

    b. a read/write unit connected to a computer containing a software application,

    wherein said application verifies the authenticity of said encrypted ID code for each of said at least one object, thereby to run said software application.

37. A software piracy protection system according to claim 36 and wherein said at least one object further comprises additional ID codes encrypted in said transponder, and wherein each of said ID codes is related to a separate software application.

38. A software piracy protection system according to claim 36 and wherein each of said at least one object comprises a single ID codes encrypted in said transponder, and wherein each of at least one object is related to a specific software application.

39. Apparatus for a software driven application comprising:

a. at least one object, each of said at least one object having an ID code encrypted therein and comprising a wireless transceiver; and

b. a software application for verifying the authenticity of said encrypted ID code for each of said at least one object in order to run the software application.

40. Apparatus according to claim 39 wherein said object is an integral component of said software application.

41. A method for indicating the value of the uppermost face of at least one n-sided object laying on a surface, said method comprising the steps of:

said at least one n-sided object transmitting data from at least the uppermost or lowermost face of said object and;

processing said data.

42. A method according to claim 41 and wherein said object comprises an ID code encrypted therein and a wireless transponder and further comprising the step of a read/write transmitting a coded identification signal to said object to decrypt said encrypted ID code.

43. A method for protecting at least one software application stored in a computer, said method comprising:

storing data associated with said at least one software application in said object;

said computer transmits encrypted ID code to said object; and

if said object contains said ID code, transmits said data to said computer; and

verifies the authenticity of said transmitted data in order to run said at least one software application.

44. A method for protecting a plurality of software applications running in a multi-tasking environment, said method comprising:

storing data associated with each of said plurality of software applications in each of a plurality of objects;

transmitting said data from each of said plurality of objects to said multi-tasking environment; and

verifying the authenticity of said transmitted data in order to run each of said plurality of software applications.

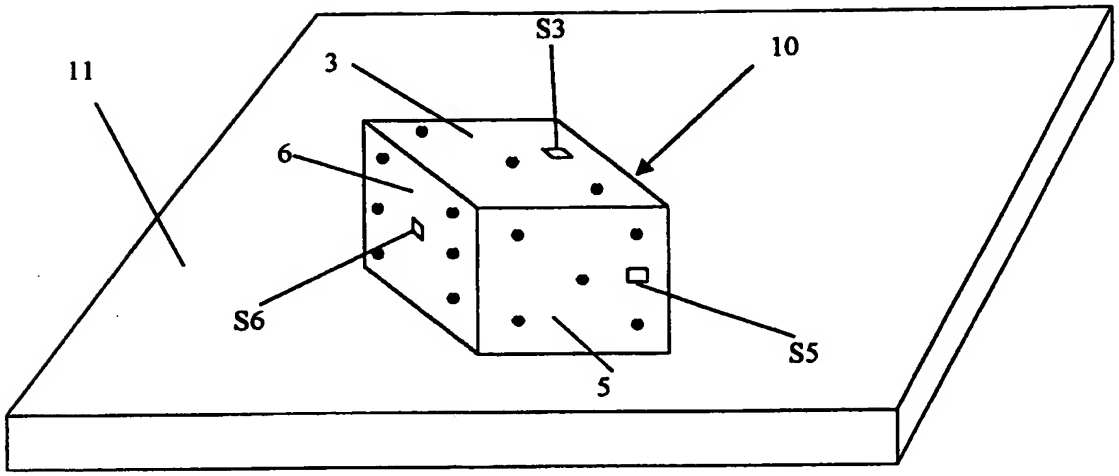
11
3
S3
10
6
S6
S5
5

FIG. 1

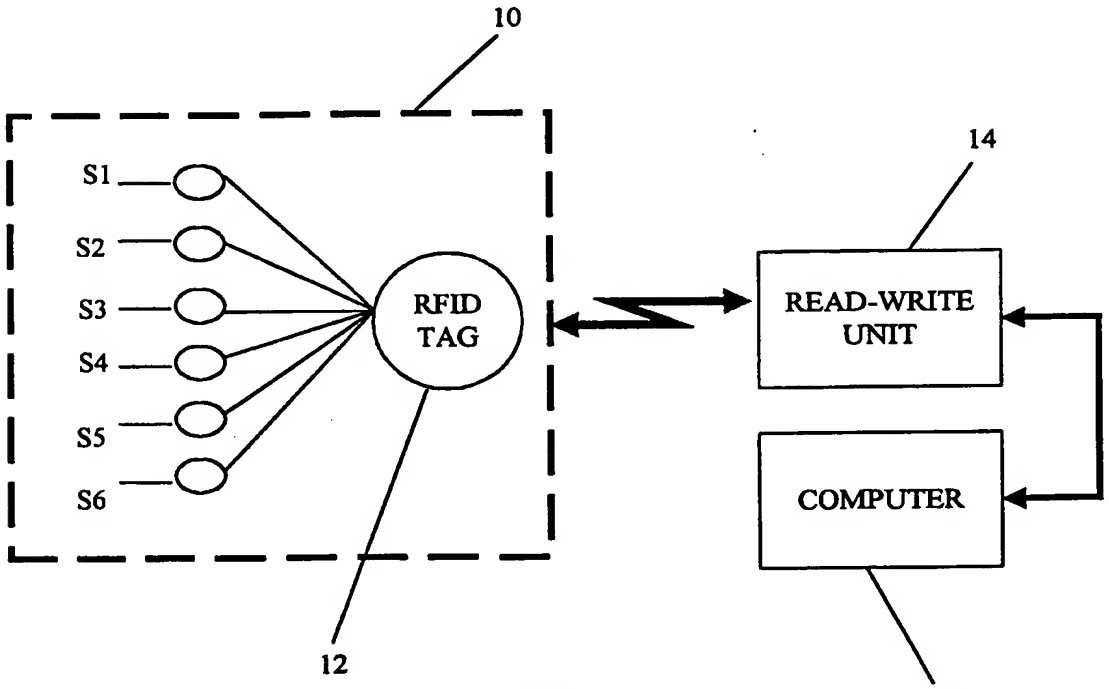
10
S1
S2
S3
S4
S5
S6
RFID TAG
12
14
READ-WRITE UNIT
COMPUTER
16

FIG. 2

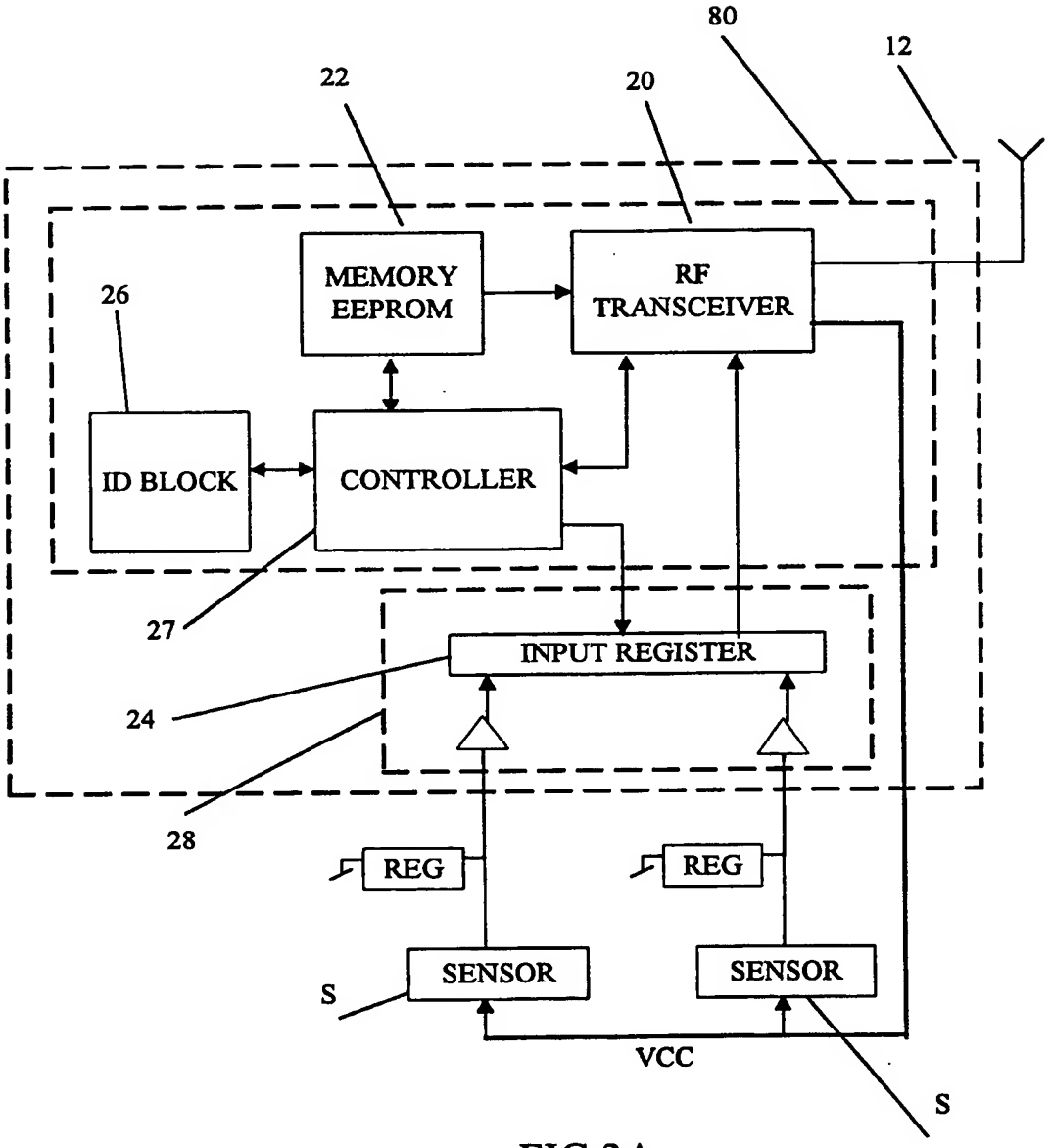
80
12
22
20
MEMORY EEPROM
RF TRANSCEIVER
26
ID BLOCK
CONTROLLER
27
INPUT REGISTER
24
28
REG
REG
SENSOR
SENSOR
S
VCC
S

FIG 3A

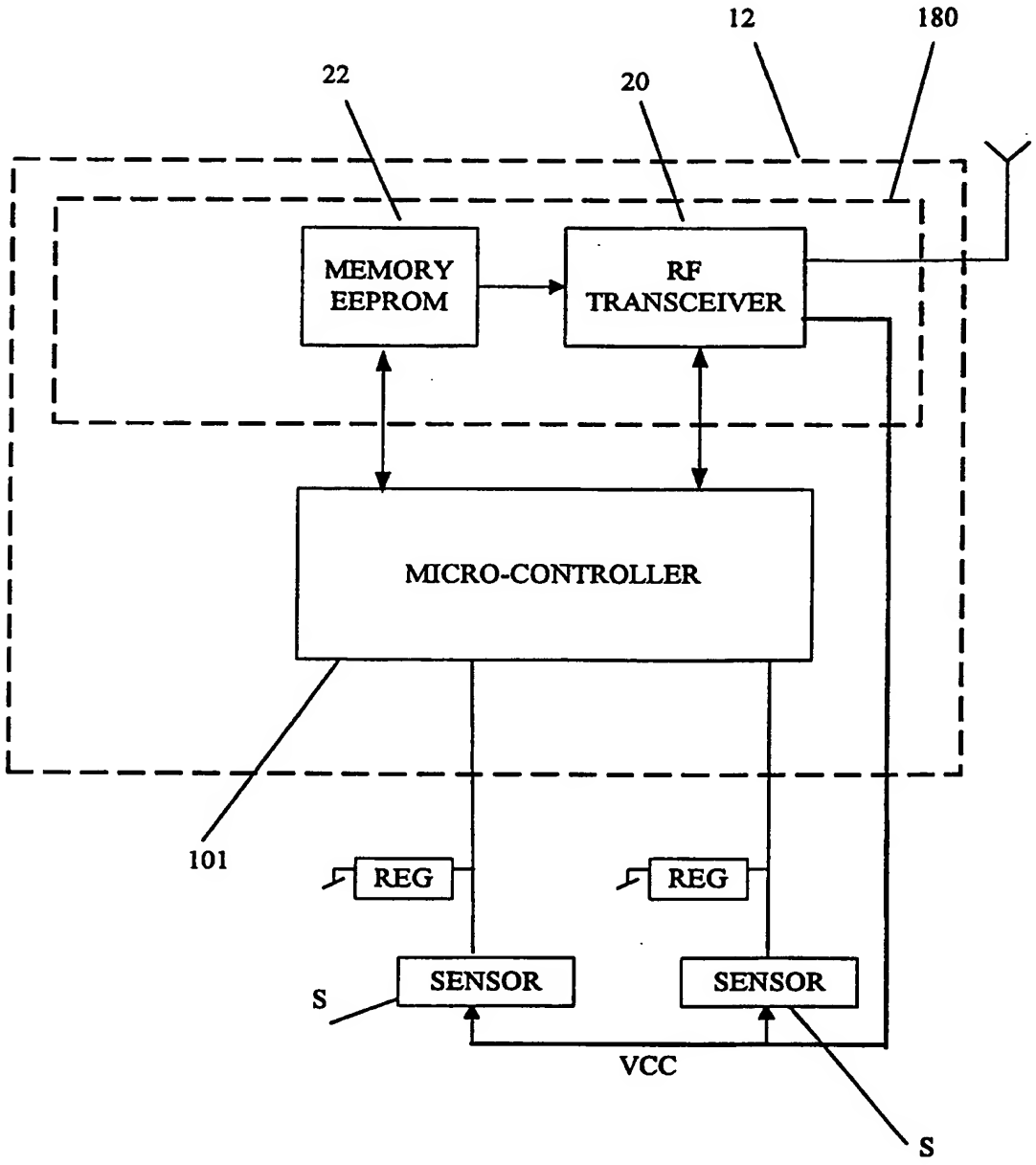
12
180
22
20
MEMORY EEPROM
RF TRANSCEIVER
MICRO-CONTROLLER
101
REG
REG
SENSOR
SENSOR
S
VCC
S

FIG 3B

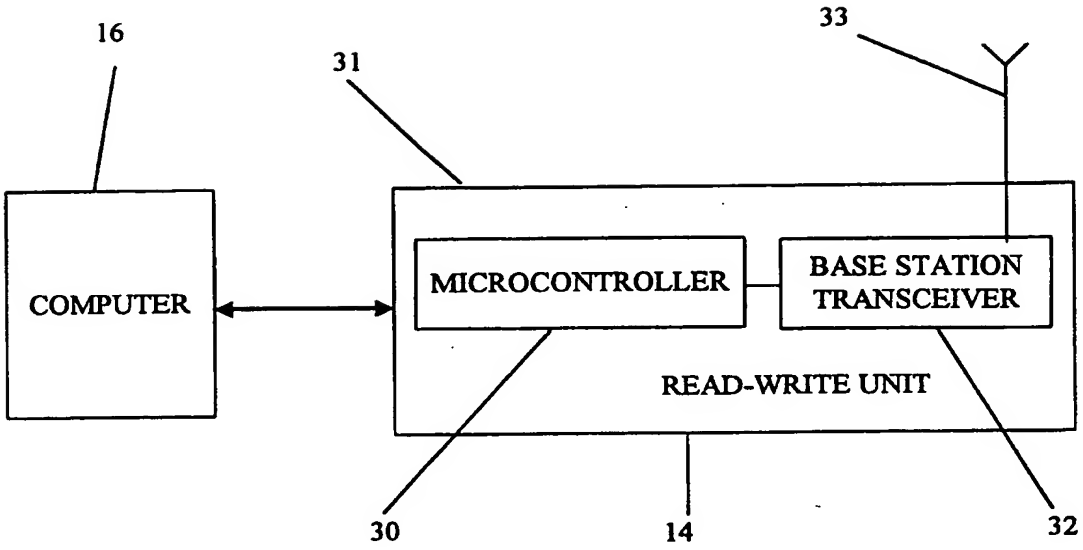
16
31
33
COMPUTER
MICROCONTROLLER
BASE STATION TRANSCEIVER
READ-WRITE UNIT
30
14
32

FIG. 4

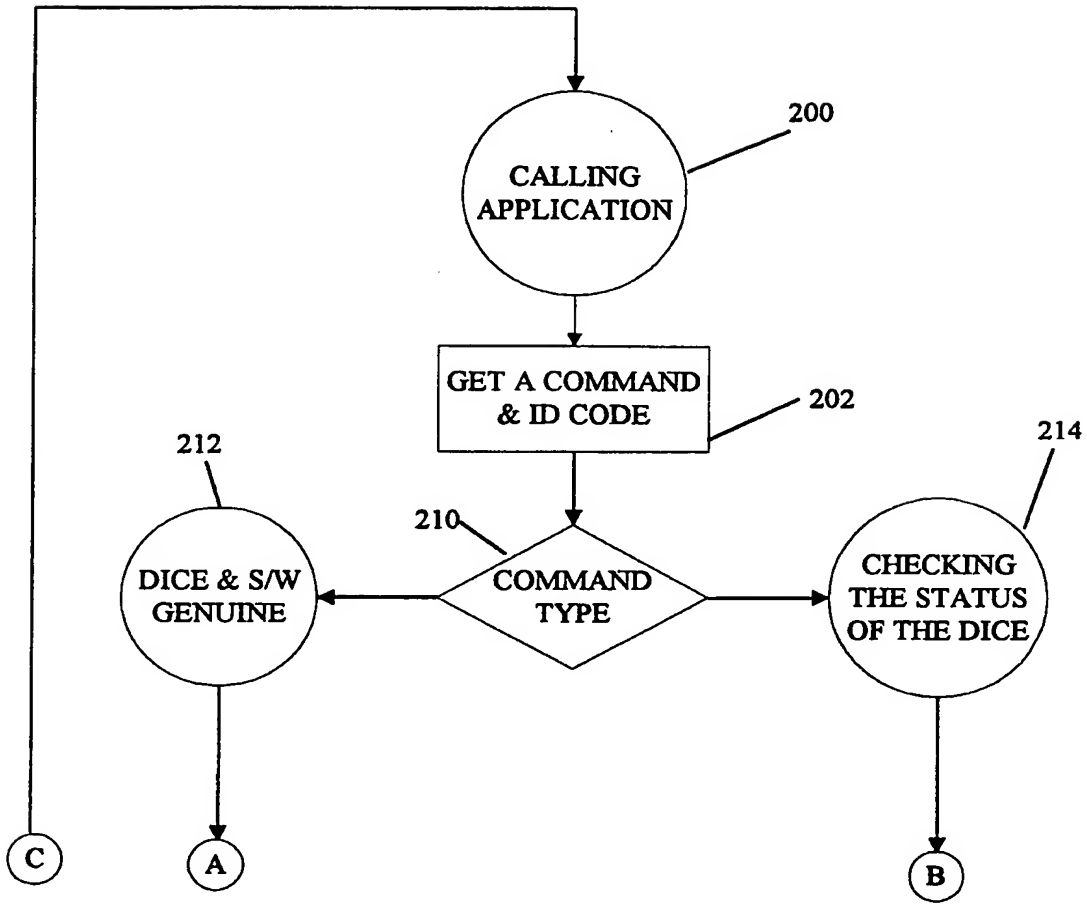
CALLING APPLICATION
200
GET A COMMAND & ID CODE
202
COMMAND TYPE
210
DICE & S/W GENUINE
212
CHECKING THE STATUS OF THE DICE
214
C
A
B

FIG. 5A

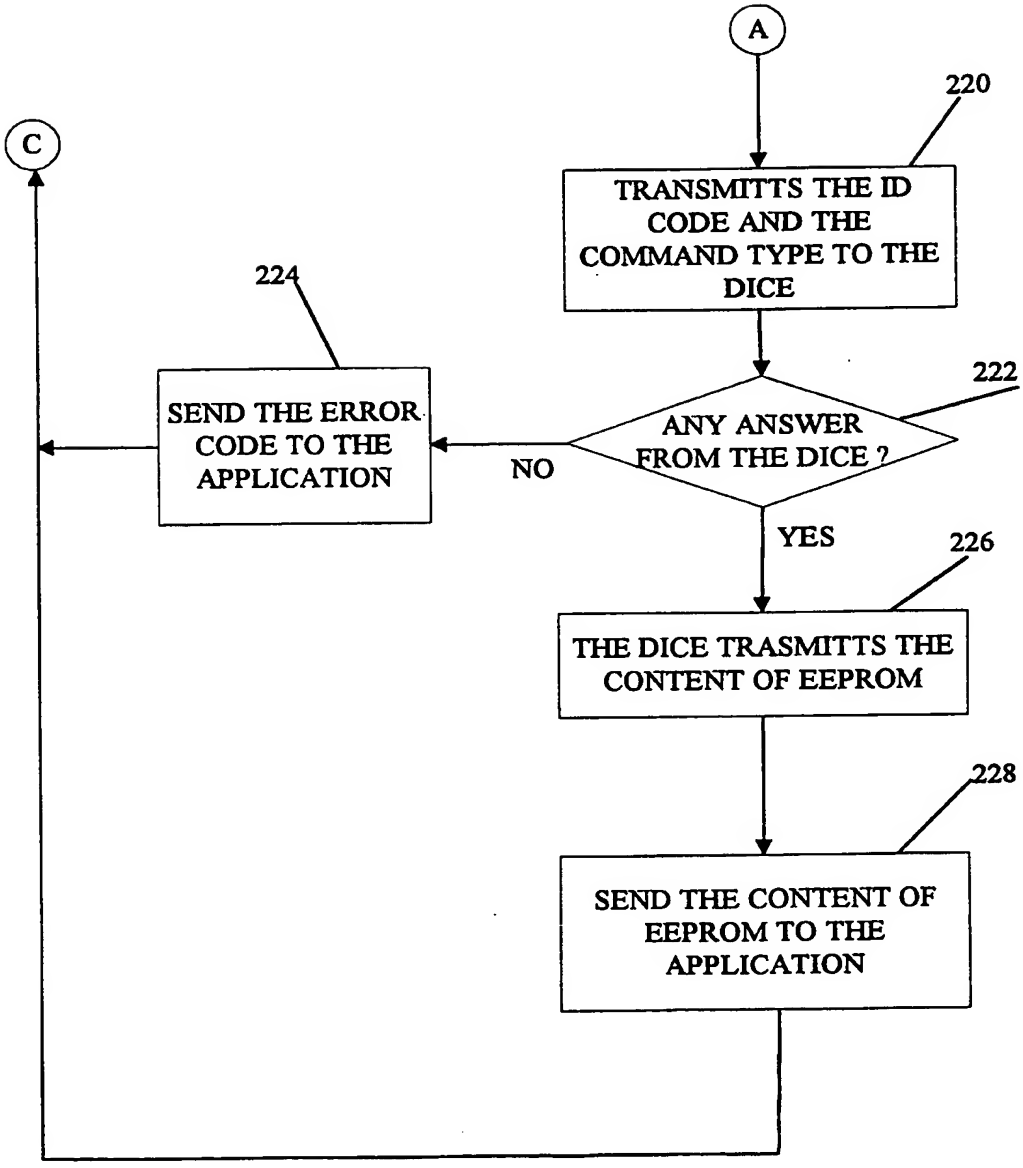
A
220
TRANSMITTS THE ID CODE AND THE COMMAND TYPE TO THE DICE
222
ANY ANSWER FROM THE DICE ?
NO
224
SEND THE ERROR CODE TO THE APPLICATION
C
YES
226
THE DICE TRASMITTS THE CONTENT OF EEPROM
228
SEND THE CONTENT OF EEPROM TO THE APPLICATION

FIG. 5B

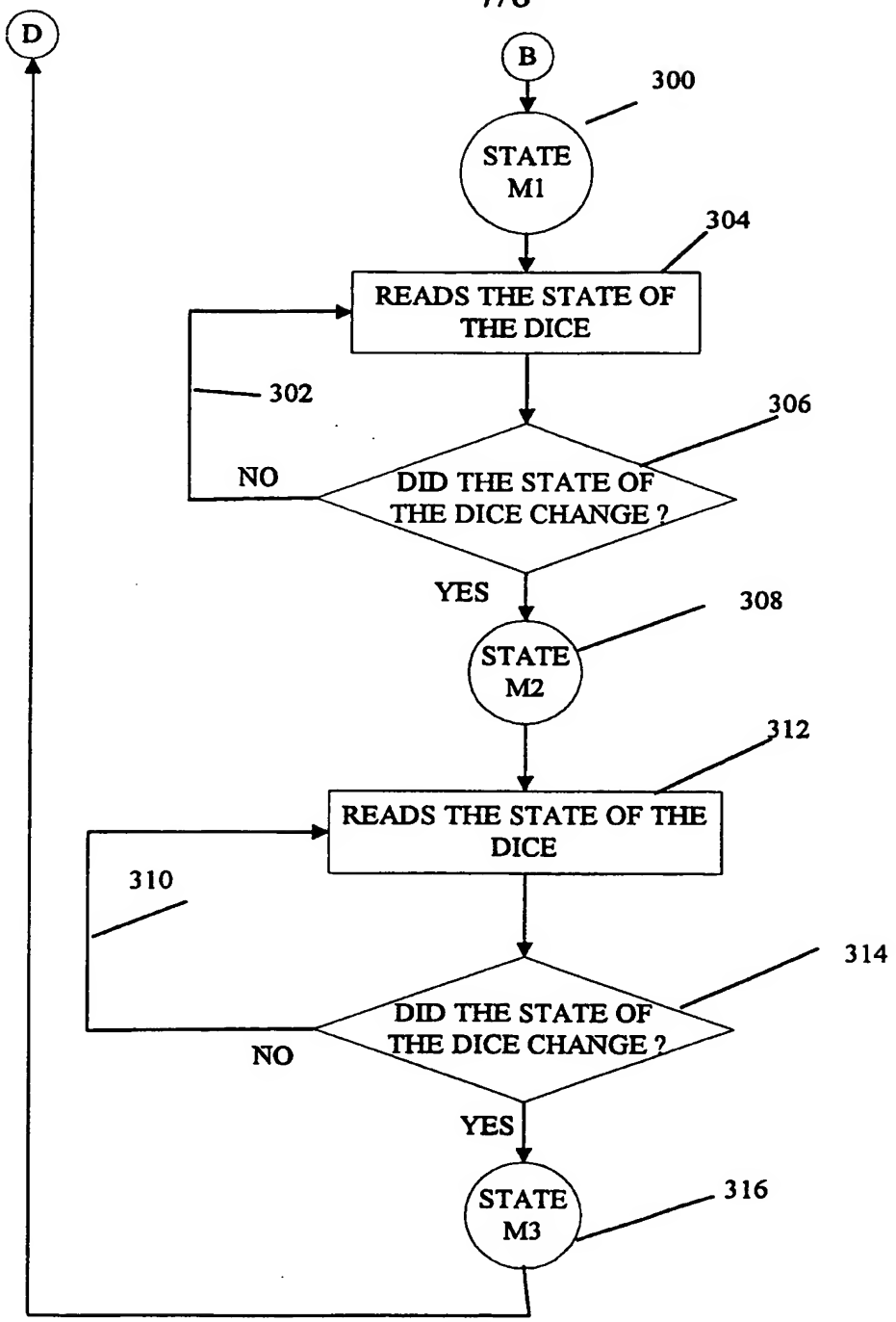
D
B
300
STATE M1
304
READS THE STATE OF THE DICE
302
306
NO
DID THE STATE OF THE DICE CHANGE ?
YES
308
STATE M2
312
READS THE STATE OF THE DICE
310
314
DID THE STATE OF THE DICE CHANGE ?
NO
YES
STATE M3
316

FIG. 5C

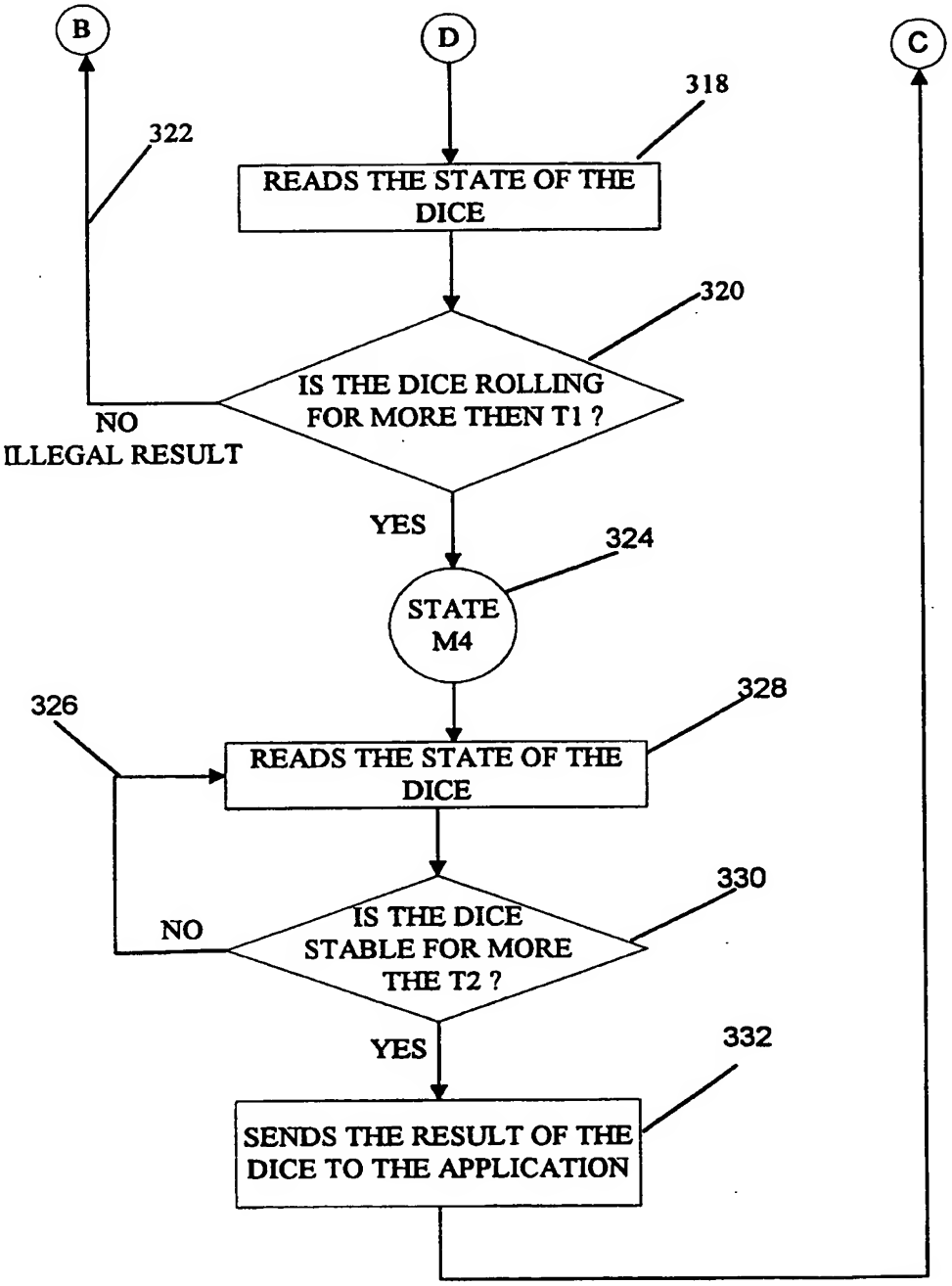
B
D
C
318
322
READS THE STATE OF THE DICE
320
IS THE DICE ROLLING FOR MORE THEN T1 ?
NO
ILLEGAL RESULT
YES
324
STATE M4
326
328
READS THE STATE OF THE DICE
330
NO
IS THE DICE STABLE FOR MORE THE T2 ?
YES
332
SENDS THE RESULT OF THE DICE TO THE APPLICATION

FIG. 5D

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00404

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :A63F 9/24
US CL :463/39; 273/146; 380/4
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 463/39, 25, 29; 273/146, 138.1; 380/4, 9, 25, 28; 395/186, 187.01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 5,651,548 A (FRENCH et al) 29 July 1997, figs. 1-3, 6.	1, 11-13, 15-17, 41 and 44 --- 2-6, 36-40 and 42-43
X --- A	US 5,166,502 A (RENDLEMAN et al) 24 November 1992, entire document.	1, 11-13, 15-17, 41 and 44 --- 2-6, 36-40 and 42-43.

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"B"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 03 DECEMBER 1998	Date of mailing of the international search report 13 JAN 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer for MARK SAGER Sheila Veney Paralegal Specialist Technology Center 3700 Telephone No. (703) 308-0547

Form PCT/ISA/210 (second sheet)(July 1992)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00404

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 7-10, 14 and 18-35
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL98/00404

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim 1, drawn to an object having n faces.
Group II, claims 2-6 and 11-13, drawn to an object having n faces.
Group III, claims 15-17, drawn to a system for communicating.
Group IV, claims 36-40 and 43-44, drawn to a protection system or a method of protecting.
Group V, claims 41-42, drawn to a method of indicating a value.

The inventions listed as Groups I and II-V do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of the Group I invention is the particular means for transmitting a value of an object lying on a surface claimed therein; while the special technical feature of the Group II invention is the particular sensors of each of n-1 faces of the object for transmitting data claimed therein; while, the special technical features of the Group III invention is the transmitting data to a read/write unit for processing by a processing unit claimed therein; while, the special technical features of the Group IV invention is the verifying the authenticity of an encrypted ID code for each object claimed therein; while, the special technical features of the Group V invention is the transmitting data from an identified face of an object claimed therein. Since the special technical features of Group I is not present in the Groups II-V claims, the special technical features of Group II is not present in Groups I and III-V claims, the special technical features of Group III is not present in Groups I-II and IV-V claims, the special technical features of Group IV is not present in Groups I-III and V claims, and the special technical features of Group V is not present in Groups I-IV claims, unity of invention is lacking.